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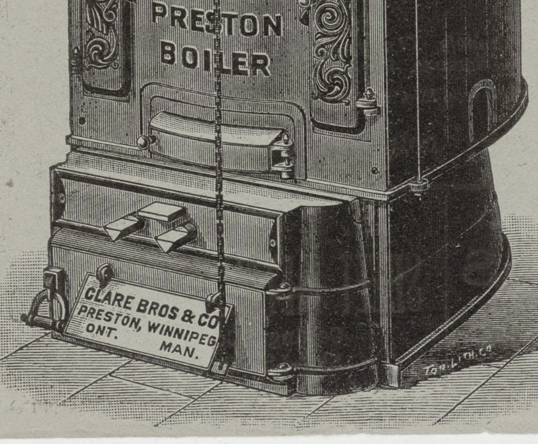

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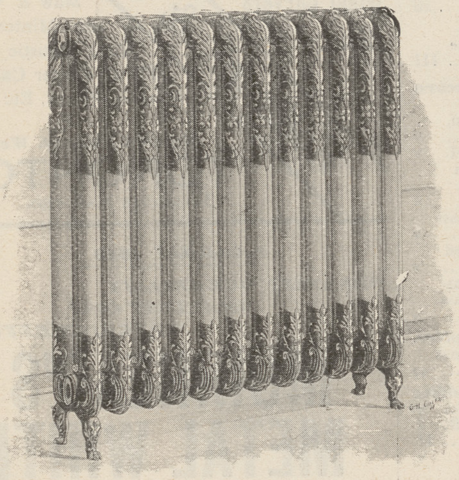

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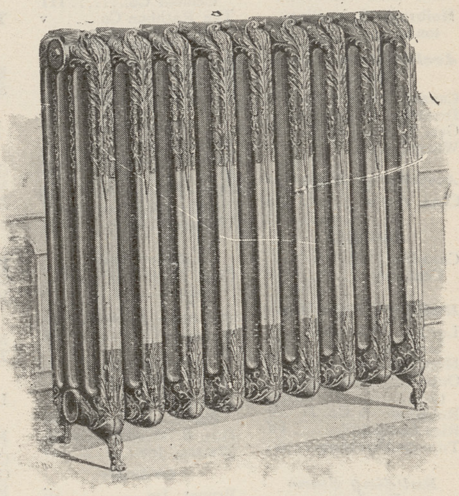

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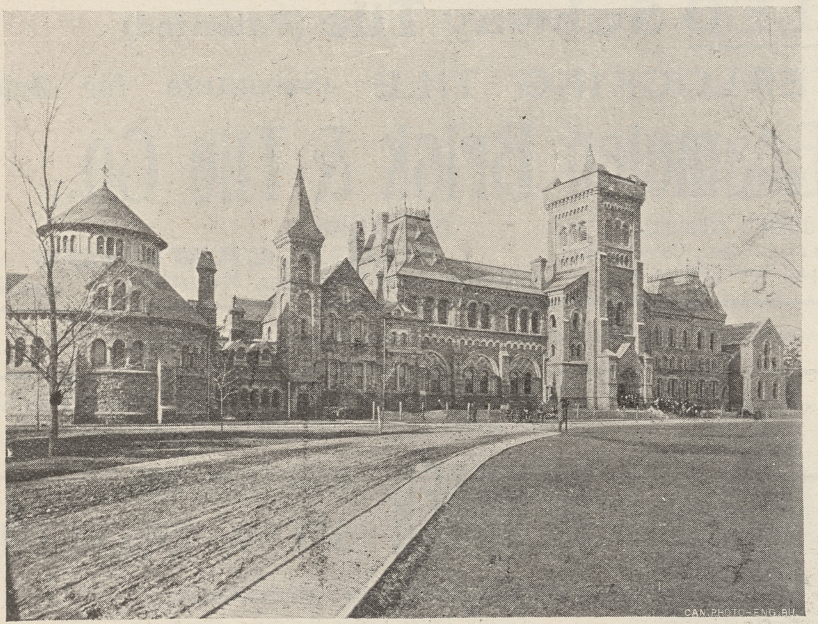

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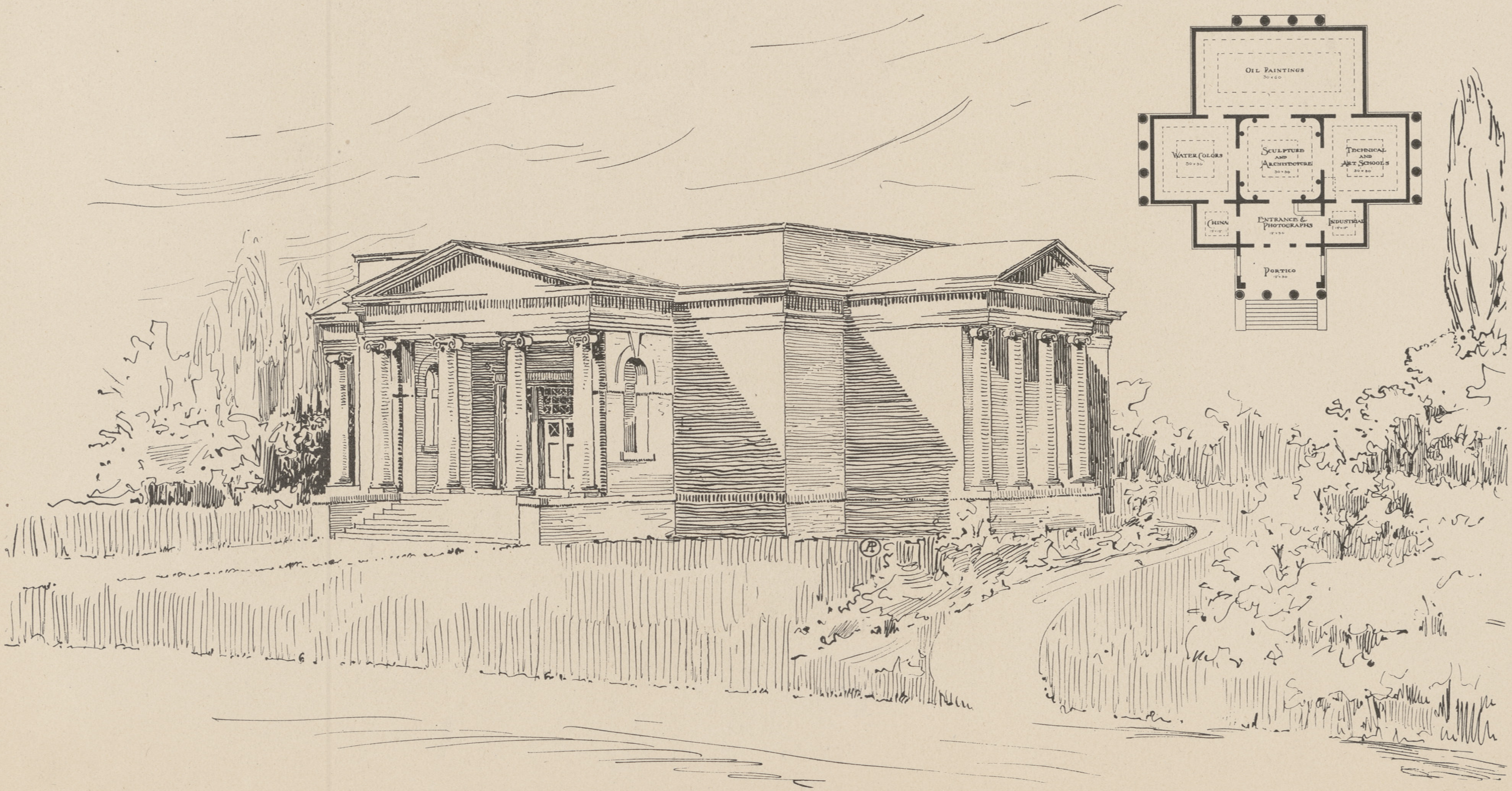

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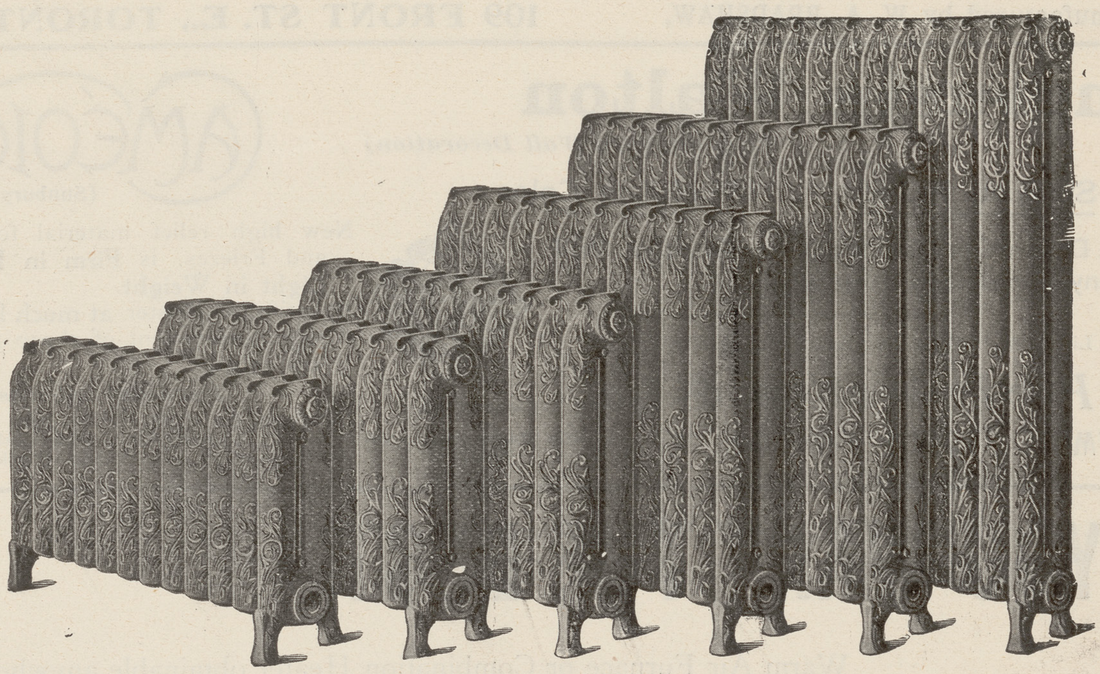

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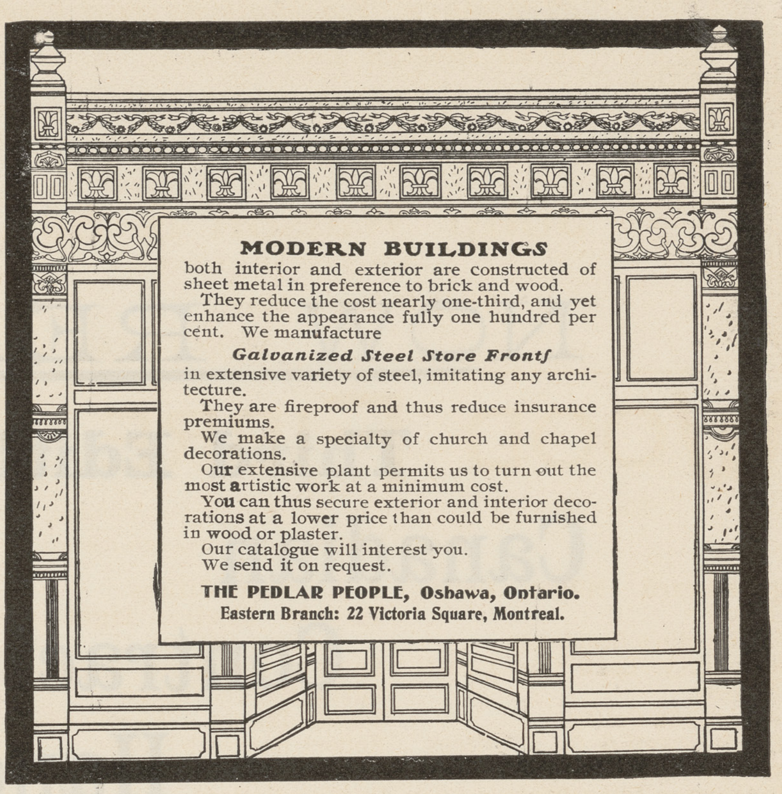

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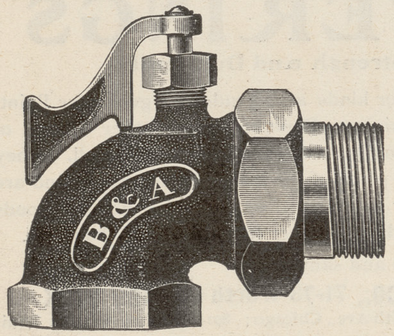

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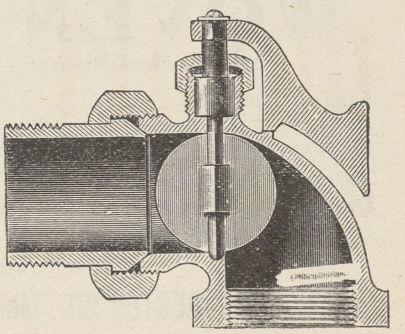

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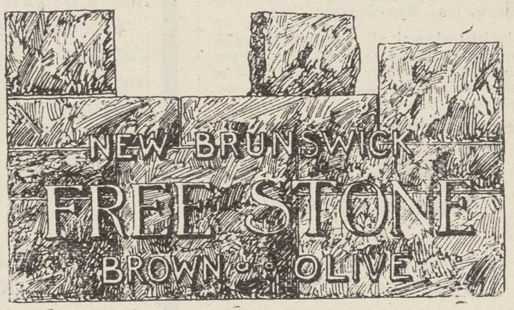

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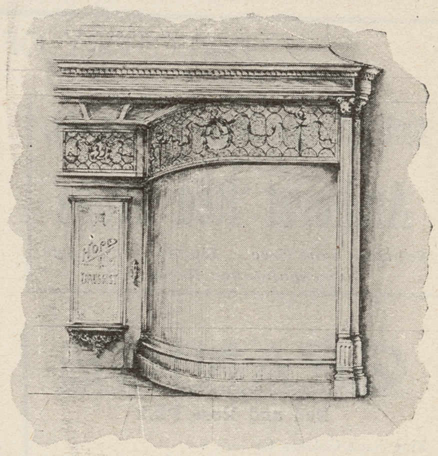

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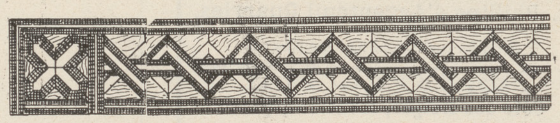

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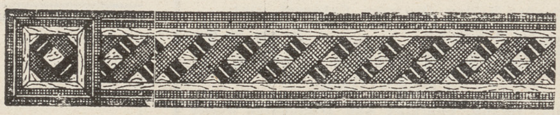

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Mr. W. A. Langton, Architect, Toronto.
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" J. C. B. Horwood, Architect Toronto.
" A. F. Dunlop, R.C.A., Architect, Montreal

The Safety of Theatres. Adverting again to this subject, to which some attention was given in our February issue, the important suggestion was recently made by a Mr. Mulholland in a paper read before the Playgoers Club of London, that a portion of the roof over the stage should be of glass, the breaking of which in the event of fire would draw off the smoke and flames from the auditorium. The advantage of this method of construction was proved in connection with a fire in the Grand Theatre, Islington. One of the greatest dangers to which an audience is exposed when a fire occurs in a theatre is from suffocation by smoke, hence the value of the above suggestion.

An Out-of-Date Building By-law. The City Engineer of Johannesburg, South Africa, recently made request of the City Engineer of Toronto for copies of regulations governing the use of iron and steel in building construction. The City Engineer of Toronto in his reply was compelled to make the humiliating confession that the Toronto Building By-law makes no reference to or provision for this form of construction. It might with equal truth have been stated that the by-law is in a hundred other particulars twenty years behind the times, and that the only effort to bring it up-to-date was made, not by the City Council, but by an outside body, the Ontario Association of Architects, the result of whose labors in the form of a draft by-law submitted to the Council, was pigeon-holed some eight or ten years ago, and has never been heard of since.

Shingling Brick and Stone Walls. The walls of some new houses now under construction in Toronto will be covered with wood shingles down to the level of the first floor. The shingles are nailed to strips of wood inserted for the purpose in the joints of the brickwork. The architect has two purposes in view in using this method of construction—first by means of horizontal lines to reduce the apparent height of the buildings and secondly to secure warmth and dryness. As regards the first of these, he is of opinion that a fault in the design of most of our residential buildings is their too great height, largely due to the free use of vertical lines. The use of shingles on brick and stone walls as a means of protection from wind and rain, has long been common in some of the country districts of the province of Quebec, as well as throughout the provinces of New Brunswick and Nova Scotia. In Quebec the north and east sides only of dwellings are frequently protected in this manner. In some cases outside stone walls are plastered with cement without the use of furring, the cement being put on with a trowel.

Women Practising Architecture

The first paper ever presented by a woman before a society of British architects was read by Miss Ethel M. Charles at a recent meeting of the Architectural Association in London. The paper was entitled "A Plea for Women Practising Architecture." The author has taken the student's course and passed the examinations of the Royal Institute of British Architects. She cleverly marshalled arguments in support of her contention that women possess equally with men the essential qualifications necessary to success in the practice of architecture. She instanced the fact that women are employed in the heavy work of chain-making and in the harvest fields as a proof of their ability to withstand physical strain. While not admitting their inability to climb ladders, she suggested as a means of overcoming the possible objection to them being seen climbing ladders, that women architects should, like Christopher Wren, be hoisted up in a basket. The achievements of women in the universities even in such subjects as mathematics and logic, were cited as evidence of their mental ability to deal with matters of a scientific and practical nature. On the artistic side it was claimed that their natural qualifications are superior to those of men. It was contended that a practical training in the workshop has ceased to be a necessary part of the training of an architect, intellectual activity rather than manual skill being the sine qua non of success. The lack of creative power in women was admitted, but the increasing self-reliance of the sex gave foundation for the hope that this power, long dormant, might be roused into activity. In the discussion which followed the reading of the paper, most of the speakers doubted the ability of women to successfully perform all the duties of an architect, especially to deal with contractors. At the same time there was manifested a disposition to give them the opportunity to try. The adaptability of women for office work, for the planning of domestic buildings and for work of a decorative character was fully recognized.

The Beautifying of Cities.

THE movement for the beautifying of cities is rapidly extending. It is gratifying to note the remarks of Mr. A. E. Ames, President of the Toronto Board of Trade, on the necessity of a definite plan for the improvement of Toronto. Mr. Ames suggests the expenditure of a reasonable sum by the City Council to secure the services of a competent person to prepare a comprehensive plan for the beautifying of the city, this to be followed by the procuring of legislation authorising the appointment of a commission to adminster funds for carrying out the plan adopted. Mr. Ames is quite right in his opinion that such a plan would secure better results than the present method of sectional improvement. The Ontario Association of Architects has been asked to support a movement to have plans prepared by an expert for the beautifying of Toronto Island. A great improvement has been effected on the Island in recent years by the efforts of the City Commissioner and Park Commissioner, but these improvements would be greatly enhanced by the preparation of a definite and comprehensive scheme to the completion of which all future efforts should tend. Every scheme for the beautifying of cities should include the architecture of at least the principal thoroughfares, and especially buildings of a public character. An important step in this direction has just been taken in New York by the introduction of a bill, drafted by the New York Chapter of the American Institute of Architects, in the New York Legislature, providing that the Mayor of New York shall, before the 1st of June next, select from a list of 100 names, presented by the Fine Arts Eederation, 50 architects who shall be declared to be "eligible architects for municipal work" and who shall carry out all architectural work undertaken by the city in the future. Provision is made for increasing the list to 100 names, after which vacancies will be filled only as they occur. The selection of architects for this list is not restricted to members of the profession resident in New York, but may include architects of standing in any part of the country.

Toronto Building By-law.

In June of last year some amendents were made to the Toronto Building Bylaws. The following section numbered 13a. was added to By-Law No. 2468 :

13a. As soon as all buildings in process of construction are up one storey high, and joists on, the said joists shall be covered or floored temporarily, or otherwise with inch boards, as each storey is built ; in cases where joists are over sixteen inches up to four feet centres, one and a half inch plank shall be used ; and where joists or beams are over four feet up to six feet centres, then two inch plank shall be used, or else two one-inch boards laid one on top of the other. In case of steel structures where the girders are twelve feet centres, two-inch plank shall be used with sufficient support in the centre."

The City Commissioner has recently notified the city contractors that compliance with this section of the By-Laws will be enforced, and that those who fail to comply with the provision will be summoned to the Courts. It will be noticed that the By-Law does not stipulate by whom the temporary floors are to be constructed. By request of the Builders' Exchange, the Toronto Chapter of the Ontario Association of Architects have appointed a committee to discuss with the builders in what way compliance with the By-Law should be made. It is clear that a temporary floor must be provided by someone. The question is whether the carpenter or bricklayer will put down the floor. The absence of a definite understanding on this point would, the builders claim, result in each of these contractors feeling under obligation to furnish the floor and charge the cost in his tender. The suggestion has been made that architects should in every case specify double floors. This is said to be the practice in the United States. We imagine, however, that architects would hesitate to saddle their clients with this extra expense, which, in the case of large buildings, would amount to a large item. Judging by the record of accidents in recent years, this amendment to the By-Laws does not seem to be necessary, and the results in the direction of increased safety to workmen are not likely to be commensurate with the trouble and expense involved. At the urgent request of the Trades and Labor Council, a city scaffold inspector was recently appointed, and it may be that this and other amendments are necessary to provide this official with employment. The amendment in question serves to illustrate the unwisdom of fragmentary changes of this character in the By-Laws. What is required is a careful revision of the regulations as a whole.

PRINCIPLE AND METHOD.

The paper on the Field of Decorative Art, printed on another page, and the discussion which followed the paper, suggest a great want in the literature of architecture. Book upon book has been written upon the historical development of architecture, but always regarding it as a historical document. The sequence of styles is perfectly established, but to whom is it of real use except to historians ! Architects value books on the subject chiefly for their illustrations, and use them, not for the purpose with which the book was written, but to help themselves in some way to design modern work. In other words every man, unconsciously or half unconsciously, makes for himself, according to his light, rules founded upon the principles of beauty, that is to say the causes of attractiveness, in the buildings he is studying, in order that he may bring into being, not the same design, which he knows to be impossible (if he is experienced), but the same attractiveness, and for the same reason, in his own work. It is needless to say how slow this process is and how ineffectual in many cases, where nevertheless the beauty of the building studied obtains full appreciation. A mind capable of conception is very often not strong in analysis. It wastes time and energy in feeling its way to the results. What is necessary to enable it to work rapidly and surely is a framework of principles and method supplied from without. This is the real use of the architecture of the past to the architects of the present—as architects; to supply models from which the causes of beauty may be deduced. It is only upon some such scientific basis of design that it is possible to invent with ease. No man can mass design by accident, and it is in massing that design really consists. As all design consists in this, all ages supply matter for its illustration. Yet how little has been said about it. We learn in works on architecture that the Greek pediment was low in pitch, that the Romans pitched their pediments higher and the Gothic designer's gable was highest of all ; but no lesson in design is drawn from this. We learn in every case merely what the designers of a period did ; and, so far as construction in design is conveyed at all, we are taught only how to carry out historical unity in design. Experience teaches that there is more in preserving historical unity than the mere avoidance of offence to the eye of the educated. We avoid also offence to the educated eye. A mixture of different historical characteristics is fatal to the harmony of design. Knowing this, but not knowing clearly what is essential and what is not, the wise man goes by his book ; and as he becomes skilled in the styles, comes, as all men do, to enjoy his skill, and love correctness for its own sake. That is to say from hatred of solecism he commits a wholesale solecism every time he builds.

This is not much to show for a faithful study of architecture. There must be more to be got out of it than that, the lesson of the history of architecture should be, not what the past designed, but how it was designed. The beauty of every great example has a reason. To return to the three classes of gables--there is reason, as shown by John Beverley Robinson, for the varying pitch. The Greek front, solid widely spread, is suitably finished with a low pitched gable, while the Roman, more slender and vertical, naturally cocks it up and the Gothic more again. This is the kind of truth we should learn from the history of architecture. To know how to be Greek or how to be Roman or Mediaeval is merely to put one's self in fetters. To know why all three were good is to give one's self the freedom of design in any age—even in our own.

Mr. H. G. Wells, who is so fond of carrying his scientific observations into the future, has, in his new book of "anticipations" about the state of the world in the year 2,000, some speculations about the conditions of building. He is of course heartlessly scientific and says, (I quote at second hand) that he expects the engineers of the future to be the great men of their time, but the architects to be opposed to progress, because they are "too highly cultured and not sufficiently educated." By "cultured" he evidently means trained in precedent, and by "educated" trained in science. Making allowances for his scientific point of view, and the probability that his idea of an architect's education is limited to a study of the properties of iron and concrete and sewage, the accusation, whether it is likely to be justified, or not, gives a judicious pointer as to the need of more scientific education for architects in the future ; an education which shall be scientific in all directions ; in design as well as in construction. The constructor has become inventive ; the designer must become inventive too. I am well aware of the horror of lean iron forms, and of the necessity of forming new ideas of beauty, that the idea of architectural invention brings before a well regulated mind. But surely to study the principles of design is the very way to prevent the realization of this horror. There cannot be more than one set of principles of beauty in this world, even if it is possible to conceive of there being another set in any other world. It looks therefore as if to take Mr. Well's advice and devote ourselves more to "education" and less to "culture" is the surest road to making beauty keep company with the necessity that is coming to us of keeping design abreast with construction in our own times.

But a new departure in design is not what this article is about. It is clear that principle and method are the only road to such a departure when it becomes necessary. Culture, in Mr. Wells sense, has already met a Waterloo in the tall buildings of New York. In their case, it is not until the dusk comes on, to obliterate

their architectural treatment, that a consciousness of their greatness is not obscured by a perception of their littleness. It must be possible to make more of such opportunities than that, and it is clear from the failure of the early efforts in this kind of building that Vitruvius is out of it this time. A study of the principles of design is particularly necessary for these problems which therefore bear essentially upon the argument; but the purpose of this article is to advocate the acquisition of familiarity with principles and facility in method for the purposes of ordinary design. All design requires it, the simple as well as the stylish; and the most affectionate adaptation of old work would be better done if the principles at the bottom of the original were open to the eye as well as the result.

Where then are these principles to be found that we may acquire them? That unfortunately is the difficulty in this matter. That is the want spoken of above, in the literature of architecture. They exist, there is enough evidence to show that. And the definition of many of them exists too, scattered here and there through the works of writers on art. Every architect has found out some for himself, and if he turns his attention particularly in that direction, will find out more. Gwilt enters into the elusive question of proportion. So does Viollet le Duc in his Lectures on Architecture. One can hardly come out of a study of these investigations without some serviceable addition to method in setting up a design. There are suggestions for practice to be gleaned from H. Heathcote Statham's Architecture for General Readers. But the most enlightening and serviceable attempt is that of John Beverley Robinson in his Principles of Architectural Composition; which he describes in his subtitle as "An attempt to order and phrase ideas which have hitherto been only felt by the instinctive taste of designers." With these books at hand. and particularly the last, we have not such a bad showing for our purpose after all. The books are all in the library of the Ontario Association of Architects.

The papers read before the Royal Institute of British Architects are very often concerned with principle and method, and a useful collection might be made from them of the opinions of practising architects upon these points. It would be even more useful if our own architectural associations devoted themselves to putting together their ideas in the form of papers upon this subject. An original paper of any kind blesses him that gives as well as him that takes. To set in order what he knows, or to classify and arrange what he can glean from books, or even to boil down John Beverley Robinson for his own personal use, is an exercise which would well repay the time expended upon it by an architect, and would be a useful contribution to the proceedings of his association.

No doubt something to this purpose can be gathered from Ruskin's architectural works; but, as the investigations of the Stones of Venice are directed towards the evidence of character in architecture as found in the detail, his principles are concerned more with conception and character in architecture and beauty in detail than with the composition of masses. In Ruskin's Elements of Drawing, the composition of landscape is considered and these rules are of course of general application—for any one who is capable of applying them.

It is this capability which we may expect to be the fruit of studying the principles of beauty in architectural composition and practising methods for their scientific application in design. The adoption of John Beverley Robinson's rules in something of the rule of of thumb manner will keep a man from being a fumbler; but, to be at home with the principles of beauty, and to have an instinct for method so as to compose with ease, one must look for these principles in all kinds of composition and study every method that holds out the hope of putting them together with some approach to geometrical certainty.

W. A. LANGTON.

BRITISH, CANADIAN AND UNITED STATES ARCHITECTURE.

An English architect who visited Toronto recently expressed appreciation of the merits of much of the domestic work under construction and recently completed in that city. In view of the proximity of Toronto to the United States, he was surprised to find the modern architecture based so largely on English instead of American lines. Even American architects, he thinks, are following, to some extent, British precedent, especially with regard to planning. In buildings of a public character, however, Americans are largely influenced by the traditions of the Beaux Arts School at Paris. They have sufficient invertiveness, however, to impart originality to the style, and to adapt it to the requirements of this Continent. In buildings of this class the English architect, as a rule, is less successful. This is believed to be due to the limited size of the sites and buildings with which he has principally to deal. Not only are the sites in most instances very limited in area, but very irregular, so that it is not possible to give to the buildings the bold treatment which is so characteristic of large buildings in the United States built on rectangular sites. Even the Germans, who have little to say in praise of English architectural design admit the skill displayed by English architects in planning. This skill is largely the result of the necessity of adapting buildings to irregular sites, while the regularity of the sites of the majority of large buildings in American cities renders planning of such structures comparatively easy. Another hindrance to broadness of effect in English street architecture is the fact that nearly all the land is leasehold. Leases belonging even to the same estate, expire at different periods, thus preventing the carrying out of any general scheme of improvement of the street frontage. Such improvements as may be made are usually arranged for when the lease of the land on which the building stands runs out. The improvement thus relates only to the individual building and uniformity of design and effect is not obtainable.

Mr. J. Wilson Gray, architect, has removed his offices from the 3rd to the 6th floor of the Confederation Life Building, Toronto.

Messrs. Burke & Horwood, architects, suffered heavy loss in books, drawings, etc., by the fire which partially destroyed the Union Loan Building, Toronto, on the morning of the 3rd inst. Fortunately their drawings of current work had been placed in the vault, and thus escaped injury. Messrs. Burke & Horwood have temporarily removed their offices to No. 15 Toronto street. The Toronto Chapter of Architects, of which Mr. Burke is chairman, passed a resolution expressing the sympathy of that body with Messrs. Burke & Horwood in their misfortune.

INTERCOMMUNICATION.

[Communications sent to this department must be addressed to the editor with the name and address of the sender attached not necessarily for publication. The editor does not hold himself responsible for the expressions or opinions of correspondents, but will, nevertheless, endeavor to secure correct replies to queries sent in. We do not guarantee answers to all queries, neither do we undertake to answer questions to issue following their appearance.]

From "Builder":—What is the rule for finding the length of braces between two posts when they incline one foot in six feet rise ?

ANS.—Suppose the illustration, Fig. 1, represents a frame, the posts of which incline one foot in six feet

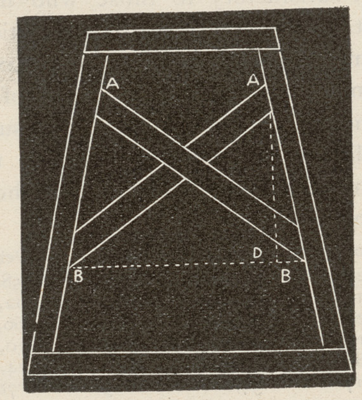


FIG. 1.—GETTING LENGTH OF BRACES.

rise. Let the distance B B represent a distance of seven feet. The braces are run at an angle of 45°. The posts inclining one foot in six leaves the distance at A A six feet. The length then may easily be found by using the steel-square which will also give the bevels of the joints. In this case the actual length of brace from point to heel is 8 ft 5 3-16 inches. The square may be applied 6 times, using 12″ mark on the blade and 12½ inches on the tongue—then lay out, the same as laying out rafters.

From "A Village Contractor":—Will you please inform me of the method generally adopted for measuring masonry, both before and after being built ?

ANS.—Stone masonry is measured by two systems, and they are again subject to local usage. These systems are called quarryman's and mason's measurements. By quarryman's measurements the actual contents are measured—that is, all openings are taken out and all corners are measured single. By mason's measurements corners and piers are doubled, and no allowance made for openings less than 3x5 feet, and only holf the amount of openings larger than 2x5 feet. Range work and cutwork are measured superficially, and in addition to wall measurement. Rough stone walls are measured by the cord of 100 feet in the wall, or 128 feet loose on the ground, and all openings less than 3x3 feet are counted solid, and half of openings above that size are counted as solid walls, to which must be added 18 inches running measure for each jamb built. Arches are counted solid from their spring. Corners of buildings are counted twice. Pillars less than three feet are counted on three sides as lineal, multiplied by fourth side and depth. It is customary to measure all foundations and dimension stone by the cubic foot, water tables, base courses and similar work by lineal feet. All sills, lintels, and ashler work by superficial feet, and no wall less than 18 inches thick. To lay a cord of stone of 128 feet loose will require three bushels of lime and a cubic yard (27 cubic feet) of sand, and when laid in wall the whole will measure 100 cubic feet, or one mason's cord.

Brickwork is generally measured by the 1,000 bricks laid in the wall. In consequence of the variation of size of bricks, no exact rule that will apply to all localities can be laid down. The following, however, is a fair average for Canada or Ontario at least, and is adopted generally by the Ontario Association of Architects :

For a	4¼	inch or	veneered wall,	6½ inches
"	9	"	wall	13 "
"	14	"	"	20 "
"	18	"	"	26 "
"	22	"	"	32½ "
"	27	"	"	40 "

This rule may vary from one-half to one brick for each superficial foot in a wall, according to size of bricks, but not any more. If the bricks are large, the number per foot of wall may be one brick less than given in rule ; if smaller, the number per foot may be increased by one foot or less. This rule is based on a standard size of 8¾ x 4¼ x 2⅛ inches. Corners are not measured twice as in stone-work. Openings over 2 feet square are deducted. Arches are counted from the spring. Fancy work counted 172 bricks for one. Pillars are measured on their face only.

A cubic yard of mortar requires one cubic yard of sand and nine bushels of lime, and will just fill thirty hods. One thousand new bricks closely stacked will require 56 cubic feet of space. One thousand old bricks cleaned and loosely packed occupy about 72 cubic feet. Five courses of bricks laid in a wall should make one foot in height of wall or chimney. Six bricks in a course will make a flue 4x12 inches, and eight bricks in a course will make a flue 8 inches wide and 16 inches long. Bricklayers generally contract for laying bricks by the 1000 in the wall, and the prices vary according to cost of materials and price of labor.

From "A Mechanic" :—Will you please explain how the different "cuts" for mitres, octagons and hexagons, are obtained by the use of the steel square ?

ANS.—Note the diagram, Fig. 2. Here we show a quarter of a circle x A C, along the horizontal line A B,

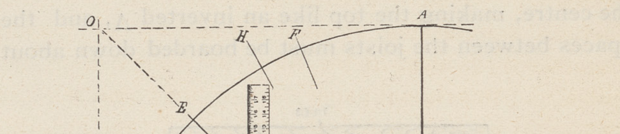
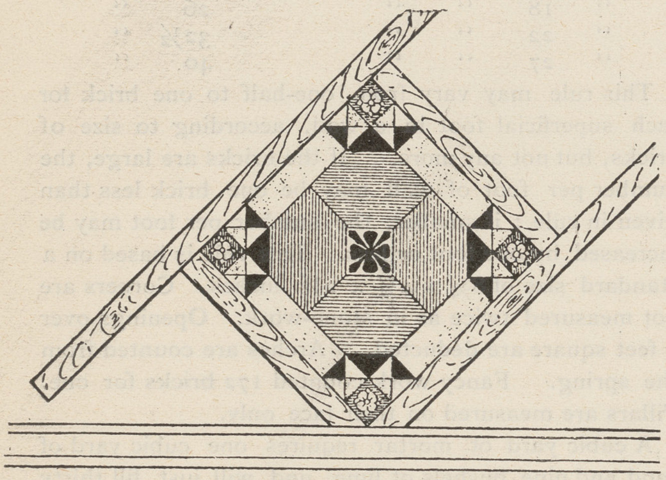


FIG 2.—METHOD OF OBTAINING CUTS FOR MITRES, FOR SQUARE, OCTAGON AND HEXAGON, BY AID OF THE STEEL SQUARE.

the square is laid with 12″ on the blade at the centre C, from which the quadrant was struck. If we divide this quadrant into halves we get the point E, and a line drawn from 12″ on the blade of the square and through the point E, we cut the tongue of the square at 12″ and through to O, and the line thus drawn makes an angle of 450, a true mitre. If we divide the quadrant between E and X, and then draw a line from C, a 12″ on the blade

of square, cutting the dividing point D, we get the octagon cut which is the line C D. Again, if we divide the space between E and X into three equal parts, making G C one of these parts, and draw a line from C to G cutting the tongue of the square at 7″, we get a cut that will give us a mitre for a hexagon, therefore, we see from this, that if we set a steel square on any straight edge or straight line, with 12″ and 12″ on blade and tongue on the line or edge, we get a true mitre by marking along the edge of the blade ; for an octagon mitre, we set the blade on the line at 12″, and the tongue at 5″ and

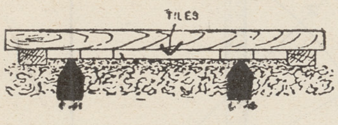


Plan for Laying Tiles.

we get the angle on the line of blade—nearly—and for a hexagon cut, we place the blade at 12″ on the line, and the tongue at 7″, and the line of the blade gives the angle of cut—nearly. The actual figure for octagon is 4 31/32 but 5″ is close enough, and for a hexagon cut, the exact figures are 12″ and 6 15/16, but 12″ and 7″ is as near as most workmen will require, unless the cut is a very long one.

From "A Subscriber":—I have a "tile-floor" to lay in a store, and, having had no experience in this kind of work, would like a few "pointers" as to how the work should be done?

Ans.—In the first place, if the tiles are to be laid on wooden joists, the joists must be deep, say 2″ x 12″ or 3″ x 10″. The tops of the joists must be bevelled off to the centre, making the top like an inverted Λ, and the spaces between the joists must be boarded down about



Section for Tile-Laying.

five inches from the top edge of the joists. On the top of the boarding must be laid concrete to the level of the joists and the whole smoothed off, and while damp a proper layer of Portland cement, not less than an eighth of an inch thick must be floated on the concrete, and on this the tiles must be laid even and level. The tiles must be well soaked in clean water before being laid on the cement. In laying tiles, always begin work in the centre of the room, and work all round until the work is completed. It is best to set straight-edges, level and out of wind with each other, then set all tiles level and true with thin gauges as shown in the illustrations. This will insure a neat and level job of work.

TESTS OF DOUGLAS FIR.

Builders are familiar with the fact that Douglas fir is among the strongest woods in the world, but figures such as have been prepared for the British Columbia Mills, Timber & Trading Co., of Vancouver, are of especial value to those interested in the subject. This company sent five fir logs to the testing and experimental works of David Kirkaldy & Son, of London, England, to be subjected to the severest bending and thrusting tests, and full data to be returned. The results show in detail that fir is in every respect satisfactory to those who have always insisted that it was one of the best varieties of wood.

The specimens give the bending test 12x15 and 16 inches in dimensions, cut to a length of 13½ feet, with a distance of 12 feet between the supports and the load applied at the center. The mean total stress in pounds and deflection in inches are shown in the following table :

Weight.	Deflection.	Weight.	Deflection.	Weight	Deflection
10,000	.027	34,000	.365	58,000	.663
14,000	.119	38,000	.414	62,000	.726
18,000	.170	42,000	.461	66,000	.804
22,000	.219	46,000	.511	70,000	.911
26,000	.269	50,000	.561	74,000	1.070
30,000	.317	54,000	.613	*78,000	1.203

*Only three pieces were given this strain.

The ultimate weight borne by the pieces was 78,714 pounds, or 35.1 tons, which was equivalent upon the beam of 93,162 pounds, or 41.6 tons. The timbers were bent to a deflection of five inches and removed.

Those tested to ascertain the resistance to depression were 12x12 and 100 inches long, with the ends faced true in a lathe. The total stress in pounds and depression in inches were as follows :

Weight.	Depression.	Weight	Depression.	Weight	Depression
40,000	.027	220,000	.114	400,000	.195
60,000	.038	240,000	.122	420,000	.205
80,000	.048	260,000	.130	440,000	.214
100,000	.059	280,000	.139	460,000	.225
120,000	.069	300,000	.149	480,000	.243
140,000	.078	320,000	.157	*500,000	.238
160,000	.088	340,000	.165	*520,000	.253
180,000	.097	360,000	.175	**540,000	.250
200,000	.106	380,000	.184	**560,000	.267

*Only three pieces subjected to this strain. **Only two pieces subjected to this strain.

The average ultimate strain of the five pieces before they were crushed was 531,656 pounds, or 3,680 pounds to the square inch, although two of the pieces withstood a stress of more than 4,000 pounds to the square inch.

CURIOUS CEILINGS.

A Russian nobleman has hit upon a curious method of ceiling decoration. Every ceiling in his mansion contains a fresco dealing with an episode in the career of his ancestors and the whole forms what is perhaps a unique example of inner roof ornamentation. Nearly 500,000 roubles has been expended upon this extraordinary work, a sum equal to approximately £71,500. Less extravagant, but undoubtedly quite as curious, is the ceiling decoration of a certain London house-holder, who has covered the surface in question with cancelled cheques returned to him through his bank. At first glimpse the real nature of this quaint embellishment is not apparent to the spectator, but the effect of same is said to be positively charming.

Chromes should not be mixed with ultramarine, which contains sulphur, as they would eventually turn brown, forming black sulphide of lead.

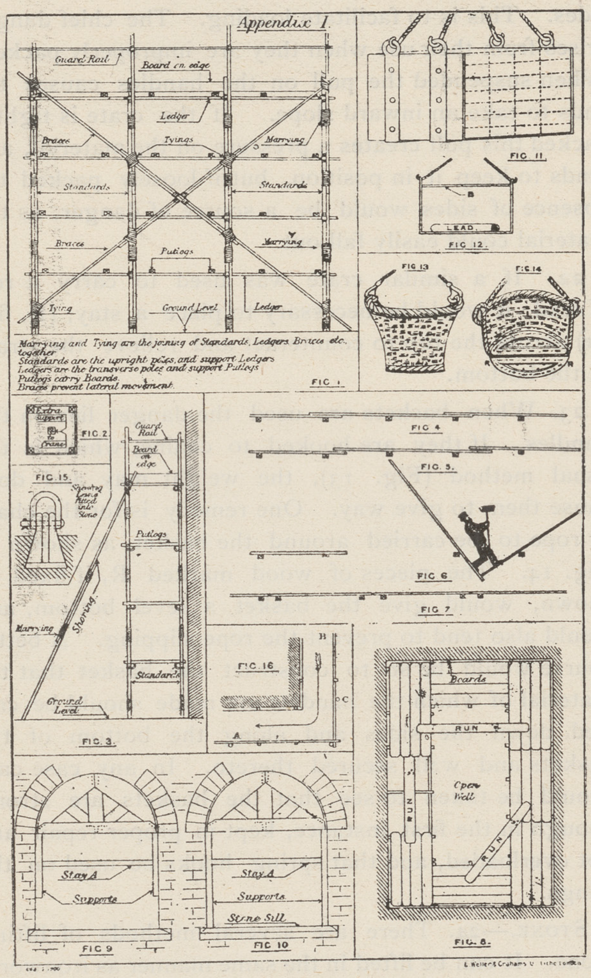
ACCIDENTS ON BUILDINGS.

The subjoined memorandum on the causes of common accidents that occur on buildings in course of construction or repair, and hints for their prevention, has been issued from the British Home Office. The modifications introduced have been made upon the suggestions of leading experts who have been consulted :—

In the following memorandum, reprinted from the Builders' Reporter and Engineering Times, an attempt is made to explain and illustrate those accidents, the causes of which may be considered controllable by the builders and workmen.

The dangerous conditions in building operations may be divided into two classes—(a) those arising from imperfect scaffolding, and (b) those arising from the lifting and carrying of material.

SCAFFOLDING--1. The two principal methods are known



respectively as the north and south country systems. The northern, as the names indicates, is principally used in Scotland and the north of England, although of late years it has also found favor in the south; the other method (see fig. 1) is essentially the south country system.

2. The first method is invariably used in conjunction with power, generally a steam crane. When one crane only is necessary it is fixed upon a triangular platform built upon three legs, one at each angle, and is raised to such a height as to be well over the building to be erected. The crane stands over the principal or king leg. Owing to the guys it cannot make a complete revolution; if power is required that can be utilised on all parts of the building, the erection has a square platform with a leg at each angle ; two cranes are then fixed, being placed diametrically opposite to each other.

3. The three or four legs, as the case may be, are of framed timber, bolted, and are weighted to the ground by masses of brickwork. The whole is so well built that accidents occurring through faults of construction are extremely rare.

4. The greatest dangers arise when the crane is imperfectly fixed, and when the weight of the crane engine and load is too much for the king leg on which it rests, and when the legs are not sufficiently far from the king.

5. With regard to the first point, the guys of the crane should always be carried to the centre of the secondary legs and chained down to the masses of brickwork which weight these legs at their feet. This chain requires frequent examination, especially when a heavy load is being raised, as, owing to the vibration of the scaffold, it becomes loose, and if not tightened the crane would lose its rigidity and accidents would be likely to occur.

6. In the second case, where the weight is great, the king leg should have an additional centre upright running from top to bottom. (See fig. 2, which is a plan of a king leg.)

7. The second form of scaffolding presents many points of interest. In order to render this report more intelligible, notes are given on the sketch (fig. 1) which explain the technical terms used. There are two varieties, again, of this form of scaffold, and their use depends upon the material of which the building is being constructed, viz., either of brick or stone.

8. Where bricks are in use one row of standards and ledgers only are necessary, the putlogs resting outwardly on the ledgers and inwardly on the wall (where header bricks have been left out for their reception.)

9. On stone buildings, and more especially when ashlar fronted and where an opening in the wall would leave a permanent disfigurement, a double set of standards, &c., are necessary to carry the putlogs. (See fig. 3, which is a section of what is known as a mason's scaffold.)

10. A few points with regard to these erections.

11. The different marryings, tyings, &c., should be carefully watched, as scaffolds have been known to come down owing to the cords slipping. This happens more especially when the cords have been used damp, the influence of a hot sun causing them to relax considerably. Wedge driving between cords and posts is the usual method of tightening.

12. The boards on which the men work should be carefully kept in position. Fig 4 shows the usual position of the boards. Carelessness may and does result in these losing their place, and if by so doing they take the position shown on fig. 5, what is known as a trap is formed. Fig. 6 illustrates the working of a trap. It will be noticed that when on the boards it is not easy to tell where the putlogs are. This creates to a great extent the danger. A certain preventative would be for the putlogs to be used in pairs, the boards then instead of overlapping could be placed end to end (see fig. 7); in overlapping boards get out of place, and a second man or two may catch his toe against the end raised.

13. Two of the commonest forms of accidents occur on these scaffolds, the falling of the workmen, and the dropping of the material from the upper floors of the erection. On the outside of the scaffold, also at the

ends, a guard rail should be lashed to the standards about 3 feet 6 inches above the scaffold boards. This would obviate the first danger. With regard to the second the danger from falling material is much to be deplored, as though it can occur in many ways, it is, as a rule, the result of great carelessness. A board on edge running along the outside of the scaffold, but within the uprights and nailed to them, and again at the ends, would, to a great extent, prevent this class of accidents. Unfortunately this board cannot be fixed on the inward side of the scaffold, as it would interfere with the free use of the workmen's tools. Figs. 1 and 3 show the guard rail and board on edge.

14. A mason's scaffold should be supported in such a manner that no opportunity could occur for it to fall away from the building. Fig. 3 shows the shoring, which is the usual method of preventing this where room permits; but this cannot be applied in a street, and in that case the scaffold should be tied to the inside of the buildings by poles through the openings.

15. There are other conditions of risk involved in insufficient width of runs, and in the use of centreing improperly supported. A run is commonly seen only one board wide (9 inches). It is needless to say that this width is dangerous; 18 inches is the least that should be allowed. A run for continued use would be better made of two 3-inch by 11-inch planks if two planks are used. A slip of wood can be nailed across the undersides to keep them together. Fig. 8 is a plan of a working platform surrounding a courtyard or well, and gives three examples of runs which are commonly used, but which are not satisfactory.

16. Improperly supported centreing is seen only in cheap work. Figs. 9 and 10 give an example of what is meant. It will be noticed that the supports to the centreing of fig. 9 are kept in their position entirely by the lateral pressure exerted by the stay A. It follows that if this pressure is eased sufficiently, say by shrinkage, it is more than probable that the centreing and a large portion of the unfinished arch would fall. Fig. 10 shows the centreing properly supported. All supports to centering should rise from a solid foundation.

16A. Painters' boats occasionally fall owing to the use of defective cordage and supports. Care is the only remedy that can be suggested.

16B. Gantries, especially those erected over the public way, having to carry great weights, should be effectively strutted and braced, and timber of sufficient strength used.

THE LIFTING AND CARRYING OF MATERIAL.—17. Very little danger arises during the lifting and carrying of material so far as the power in use is concerned. The accidents generally occur owing to the defective manner by which the material is secured to the crane, pulley wheels or whatever the arrangement for lifting may be.

IRONWORK.—18. Ironwork is principally used in the forms of girders or columns. They are sometimes slung by a chain around the middle and as evenly balanced as may be. There is considerable danger of this chain slipping, however well balanced (more especially if the load when swinging is tilted, say by receiving a jar through touching some part of the erection) and thus allowing the material to fall. To prevent this a second chain may be run from each end of the column or girder to a point some distance up the supporting chain, but the best remedy is a "softener," i.e. an old bag or sack put round the ironwork first, and the chain turned twice around it over the "softener" and knocked as close as possible, then no slipping will take place.

The same applies to timber.

TIMBER.—19. Timber in lengths can be carried in the same manner as the iron girders, but owing to the greater friction set up between wood and iron it is not so likely to slip as the former. The same precautions however, are necessary.

BRICKS, SLATES, ETC.—20. Bricks, slates, &c., in large quantities are slung in crates, in smaller quantities in baskets, and in small work are carried in hods by laborers.

21. The crates (fig. 11) will carry as many as 350 bricks. It will be noticed that they are not fitted with sides. This is to facilitate loading. The chief danger arises from their use when they are improperly packed. When suspended the pull on the handles causes the ends to take an inward slope. If the crate is tightly packed this pull creates a pressure on the material, and tends to keep it in position, but if loosely packed the absence of sides would be a source of danger, as the material could easily fall out.

22. If a similar crate was used to carry a roll of lead, it would be necessary to place a stay, (B, fig. 12) across the top to counteract and relieve the strain at the bottom.

23. When baskets are used the danger lies in the handles. If they are hooked to chains, which is the usual method (Fig. 13), the weight may and does cause them to give way. One remedy is for the chain or rope to be carried around the basket, as shown in Fig. 14. The pieces of wood marked R, if fixed as shown, would give the basket a level bottom, and would also tend to prevent the rope slipping. A better course would be so to construct the basket that the material of which the handles are made should be carried down the sides and along the bottom of the baskets and well secured thereto. In any case care should be taken to see that the baskets are strong enough in the first instance, kept in proper repair and not overloaded, and that spring hooks be used on the slings.

STONE.—24. There are several methods of lifting stone. It can be lifted in the same manner as ironwork, or may be suspended by means of a "lewis," or again by means of nippers.

25. The first method is perhaps the safest, but is generally used for undressed work only, as the chain is apt to break up any finished edges, etc.

26. The second method—by a lewis. A hole is cut into the stone wider at the bottom than at the top, three pieces of iron, as shown on fig. 15, are fitted into it, the outside or splayed pieces first, and the rectangular centre piece last. A bolt running through the top of each fixes its position, and at the same time secures a ring into which the hook, by which it is to be lifted, is placed. This arrangement will lift a very great weight, They are made in all sizes to suit; the softer the stone the deeper they ought to be in proportion to the weight. The risk of its giving way if the stone is not free from vents, or when the lewis does not fit the hole, or again, if the weight is not evenly dis-

tributed, is considerable. Its use with perfect safety can only be left to the judgment of the mason.

27. The nippers clutch the stone on the outside. Danger may arise if the small holes picked out to receive the nippers are so near the top edges of the stone that the points drag out; or again, the centre of gravity may be above the points causing the stone to turn over and fall.

28. It is, of course, assumed that the plant in use has been, both in point of quantity and quality (and the first is of equal importance with the second), fully sufficient. It is regrettable that often in actual practice this has been found not to be so. Inferior tackle has been and is responsible for many accidents. Many lives, again, could have been saved if a little forethought had been used, and compliance made with those unwritten rules by which workmen should be guided. Fig. 16 will give a clear illustration of what is meant. A labourer in building a scaffold required a ledger at point A. He fetched it from point B. He carried it upon his right shoulder, and in turning the corner in the direction of the arrow the end of the pole struck against standard C. The recoil immediately knocked him off the scaffold. If the pole had been on his left shoulder the blow would have fallen harmlessly, and his life would not have been lost.

The following suggestions, if carried out, would tend materially to reduce the number of accidents occurring on buildings in course of construction or repair :—

(1) All working platforms above the height of 10 feet taken from the adjacent ground level should, before employment takes place thereon, be provided throughout their entire length on the outside and at the ends—

(a) With a guard rail fixed at a height of 3 feet 6 inches above the scaffold boards. Openings may be left for workmen to land from the ladders and for the landing of material.

(b) With boards fixed so that their bottom edges are resting on or abutting to the scaffold boards. The boards so fixed should rise above the working platform not less than 7 inches. Openings may be left for the landing of the workmen from the ladders.

(3) All "runs" or similar means of communication between different portions of a scaffold or building should be not less than 18 inches wide. If composed of two or more boards they should be fastened together in such a manner as to prevent unequal sagging.

(4) Scaffold boards forming part of a working platform should be supported at each end by a putlog, and should not project more than 6 inches beyond it unless lapped by another board, which should rest partly on or over the same putlog and partly upon putlogs other than those upon which the supported board rests.

In such cases where the scaffold boards rest upon brackets, the foregoing suggestion should read as if the word bracket replaced the word putlog.

N. B.—Experiments have shown that a board with not more than a 6-inch projection over a putlog can be considered safe from trapping or tilting.

(5) All supports to centreing should be carried from a solid foundation.

(6) In places where the scaffolding has been sublet to a contractor, the employer should satisfy himself before allowing work to proceed thereon, that the foregoing suggestions have been complied with and that the material used in the construction of the scaffold is sound.

TESTS OF STRENGTH OF HOLLOW BUILDING BLOCKS.

At the present time interest is being attracted to the use of hollow blocks in place of solid brick in building construction. The advantages of these blocks are well known and some of them may be enumerated as follows : The principal advantage probably is in the saving of weight. In shipping this is of great importance, especially where the material must be sent long distances. In the walls themselves the saving of weight may often be of great importance as it lessens the loads on the other parts of the building and on the foundations. Another advantage is in the air spaces in the walls made by the hollow spaces which insure a drier wall. As regards the convenience in rapidity of laying the writer's impression is that the hollow blocks have the advantage in this, but he would request the opinions of others who have had experience along this line.

However hollow blocks are comparatively new in the construction of brick masonry and it often becomes difficult to secure their use. The principal objection which is raised to them is their lack of strength compared with solid brick This objection is so strongly urged that it furnishes a valid excuse for the presentation of a few tests which are to be described below. In the summer of 1901 the Grinell Opera House Co., of Grinnell, Ia., was considering the use of hollow bricks in the construction of their new opera house. Fearing that they were too weak for the purpose the company decided to have some tests made before deciding on their use. The specimens to be tested represented the product of the Mason City Brick & Tile Company, of Mason City, Ia., and were not selected by the company for the test. Instead they were taken at random from a pile of hollow blocks already delivered in Grinnell for the construction of another building. Hence they may be supposed to represent the average material that is actually used in building.

Four blocks were tested. Tests were made on the 100,000,lb. Riehle testing machine at the Iowa State College at Ames. The sizes of the blocks were respectively 4x8x12, 4x4x12 and 4x5x12. Two blocks 4x8x12 were tested. The 4x5x12 is an unusual size. These are the nominal dimensions in each case. Actual dimensions sometimes varied a quarter of an inch or a little more from those given. The results are indicated in the following table.

SIZE AND POSITION OF BLOCK.	TOTAL LOAD, LB. First Crack.	Crushed.	TONS PER SQ. FT. First crack.	Crushed
12x8x4-Flatwise	13,500	79,500	10.9	64.0
12x8x4-Edgewise	9,000	39,750	13.5	59.6
12x5x5-Flatwise	10,000	34,000	11.5	39.1
12x4x4-Flatwise	12,000	38,600	17.6	56.5

In all these tests the specimens were imbedded in plaster of Paris at the top and bottom which was allowed to set in 90 minutes. An adjustable top bearing was used to enable the machine to adjust itself to lack of parallelism of the top and bottom.

For comparison it may be said that architects allow

* A. Marston, in Brick.

5 to 10 tons per square foot pressure on brick masonry. This would give a larger factor of safety even in the case of walls built of hollow blocks. Of course in the wall built of hollow blocks piers of solid brick are usually built to carry concentrated loads from beams and trusses. It would take a solid wall of common brick about 80 feet high to give a pressure of five tons per sq. ft. from its own weight alone, and of course the walls of hollow blocks would have to be much higher than this before giving a weight of five tons per sq. ft., which our tests show would be only about one-tenth of the strength of the hollow block.

The writer has made a few other tests of hollow blocks which gave still stronger results than in these cases. It would therefore appear in general that hollow blocks should furnish a wall amply strong for the circumstances under which they are commonly used.

CONCRETE CONSTRUCTION IN BUILDING.

The Railroad Gazette prints the following particulars regarding the method and cost of concrete construction as employed in car shops at Elizabethport, N. J. :—

The concrete used in this work was in some cases made with an aggregate of engine cinders, in general with the porportion of 1 part of cement, 3 of Edison sand and 6 of cinders. Gravel aggregate was also used, composed of gravel as it came from the bank, mixed with sand and unscreened. About 1 per cent. was in cobble-stone two inches in diameter and over, the balance all sizes of gravel and sand to the smallest. When this was employed it was mixed with cement only, the amount of cement used being determined by experiment. In all cases the concrete was mixed very wet, so that no ramming was required. After being deposited it was puddled with a light wooden rammer to secure an even distribution. No attention was paid to the weather, concrete being mixed and deposited in any weather in which men could work.

When the temperature dropped below 25 degrees all water used was brought nearly to the boiling point and salted, using one pound of salt for 18 gallons of water. When the work stopped at night it was covered with canvas between the forms and sprinkled with salt. The forms for the work below ground were of rough hemlock; above ground, of yellow pine painted with soft soap, which gave a smooth surface. No provision was made for expansion and contraction from temperature changes with cinder concrete. This is good practice, but in gravel concrete a joint should be made about once in 150 feet. Some of the concrete was mixed by hand, some of it in mixing machines. Wherever the walls were less than 18 inches thick it was found that hand mixing was more economical, the labor cost for mixing and depositing the concrete being frequently as low as 50 cents per cubic yard. Where the machines were used the cost for mixing was reduced, but the cost for handling and depositing was so much increased as to over-balance it. In general, it may be said for building work that no machine mixer is economical that cannot be transported as easily as a wheelbarrow.

Facing putty may be prepared by mixing together equal parts of whiting and white lead and a small quantity of litharge, mixed together with boiled linseed oil. It is especially good for stopping small flaws in hardwoods.

BLISTERING OF PAINT.

A correspondent of the London Decorators' and Painter's Magazine gives the following causes and remedies :

1. Painting upon damp wood.
2. Using old paint which is fatty, which a lot of master painters do, telling the men to add some terebine to make same dry.
3. Having too much oil in the paint, and applying same too thickly.
4. Using too much driers, which causes the paint to dry on the top, forming a skin which, if followed up by other coats, dries in layers instead of forming one hard surface.
5. Boiled oil, I find, blisters sooner than raw, so I use it sparingly.
6. The painters do not use enough elbow grease in applying their paint, for I find in four cases in every six they apply too much paint on, instead of less and brushing it well out, which, if attended to, would make a better class of work.
7. The quality of materials.
8. I have also noticed several cases where fatty paint has been used. It blisters sooner on knotting than the other portions.

BUILDING WRECKING.

The building wrecking business is a comparatively new one in New York, and is the direct outgrowth of the extensive architectural improvements which have transformed the city of New York in the last two decades. When a piece of property is purchased now-a-days for the purpose of erecting on it a new business building or apartment house the owner is usually anxious to have the plot cleared for the builder, and in most instances even the foundations are taken out, so that new and more massive masonry may be constructed. It was the custom before the days of the wrecking concerns to give the builder the contract to take down the old structure on the site on which the new one was to be erected, and while some of the material was saved the greater part of it was carted away as fuel, junk or rubbish. The wrecking concerns to whom the demolition of buildings is now entrusted know the value of old building material, and usually find a market for the heaps of debris which look valueless to the layman.

"One must be an all-round mechanic, a builder, and a judge of values," said a man who makes his living by tearing down buildings, "to be a successful wrecker. It's nothing to pull down a house and save the big pieces, such as stone steps, sills and lintels, carved mantelpieces and inside fittings. That was enough in the days when there was no competition, but now-a-days we must save every foot of pipe, the ordinary woodwork, and even the nails out of the floors to get even on close bargains."

Much of the material which comes from the wrecked buildings is sold on the spot and carted away by the purchasers, but large quantities of all kinds of building material are stored in yards where they are easy of access when the customer who wants ready-made door-steps or well seasoned bricks may come to buy. Sheds are provided for the storage of doors, counters, wainscoting, window frames, flooring and trim, and racks and bins contain iron and lead pipe, gas and water fixtures, and nearly every item in the line of builders' hardware.

NOTE ON PORTLAND CEMENT MORTAR.*

By Charles P. Hogg, M.I.C.E

The object of this note is to draw the attention of engineers and others to the influence of the quality of the sand used in making Portland cement mortar. The subject was incidentally referred to in the paper on "Limes and Cements : their Nature and Properties," read by Mr. Alexander M'Ara, before this institution last session, in which he said, "As to the quality of sands, they are of very wide variety, so much so, that one part of an inferior, or soft clayey sand, will reduce the strength of mortar as much as three or four parts of clean, sharp, granite sand."

Engineers have devoted a great deal of care and attention to obtaining Portland cement of the very best quality, and of late years, fineness of grinding has been strongly insisted upon, in addition to the usual tensile test, it having been found that the fine granular residue had no cementitious value. There is no standard specification for Portland cement, but the following may be taken as a fair example of present-day practice : "The Portland cement shall be ground to such fineness that it will pass through a sieve of 2,500 meshes to the square inch, and that a residue of not more than 10 per cent. will remain in passing it through a sieve of 3,600 meshes to the square inch. Briquettes of neat cement, after being immersed in water for seven days, shall bear, without breaking, a tensile strain of 360lb. per square inch. The cement when made up neat, must not at any season of the year set in less than one hour."

In large contracts, it is usual to specify further, that the cement is to be emptied out on the wooden floor of a dry shed and turned over several times. This not only cools the cement, which is often delivered hot, but by air-slaking renders the free lime harmless.

If the cement is allowed to lie on the floor of the shed for several months, tests made from the exterior of the heap show a considerable decrease in the tensile strength of the cement, but those made from the interior of the heap generally show an increase. The results of a number of tests on this point show that the tensile strength of briquettes made from the exterior of the heap increase by nearly 300 lb. per square inch from seven up to 26 days, while the increase during the same period on briquettes, made from the interior of the heap, would probably not exceed 200 lb. per square inch.

What is known as the sand test is sometimes also specified in these terms : "The cement for testing is to be gauged with three times its weight of dry sand, which has passed through a sieve of 400 and has been retained upon one of 900 meshes to the square inch. The cement and sand having been well mixed dry, about 10 per cent. of their weight of water is to be added, and briquettes formed in moulds. The briquettes, having been kept in a damp atmosphere for 24 hours, are to be put into water, and to remain for 28 days, and they must then bear, without breaking, a tensile strain of 160 lb. per square inch."

The test for freedom from expansion, or contraction, is seldom specified, but it is important, and it is easily carried out by making two pats, 3 in. or 4 in. in diameter, on pieces of glass or slate. One of these should be placed in water, after it sets, and the other left in air. A good, sound, well matured cement should show no signs of cracking or lifting in either of the pats.

Now, while engineers have taken all these elaborate precautions to obtain Portland cement of the very best quality, they have, generally, been content to specify simply that the sand shall be "clean and sharp," and the consequence is that, in many cases, sand is used for Portland cement mortar which reduces the strength of the mortar to a much greater extent than the amount of sand added would lead one to expect.

The sand test is supposed to be carried out with sand of standard quality, but where is such a sand to be obtained? In practice the question resolves itself into the cement manufacturer supplying the very best and sharpest of sand he can possibly procure. There is always the difficulty of obtaining a standard sand, and there is, further, the objection that tests made with a standard or normal sand give no indication of the strength of the mortar obtained with the sand in use on the work under construction. The general consensus of opinion is to the effect that the finer the cement is ground the stronger will the mortar be with any given quality of sand; but if a soft, impure sand be used, the advantage of fine grinding would have been far better spent in obtaining cleaner sand or in washing and cleaning the impure sand. Both mud and shale are highly objectionable in sand for cement mortar. The precentage of mud in any sand may be obtained approximately by placing a quantity of the sand in a cylindrical glass vessel containing water, shaking the contents together a little, and then allowing the materials to settle. The particles of sand go down at once, and the fine mud in suspension in the water settles finally on the top of the sand.

The importance of using really good sand for Portland cement mortar is so great, that the author is inclined to advocate the adoption of the sand test rather as a test of the quality of the sand than the cement. Taking the tensile strength of the neat cement as a standard, he would reject any sand which reduced that strength beyond a given percentage.

Taking the qualities of the various sands into account, tests lead to the following conclusions as regards cement mortar : (1) That sand containing particles of shale should be avoided as far as possible, more especially if the shale is inflammable. (2) That, generally, coarse sharp sand is to be preferred to soft fine sand. (3) That sand containing any trace of clay, mud, or earthy matter should be washed before being used. (4) That sandstone shiver sand is as good as the best sand.

* From Transactions of the Institution of Engineers and Shipbuilders, Scotland.

TREATING MARBLE.

Compare a slab of marble, hand polished, with one that has been polished by machinery, says Mr. Halsey Ricardo. In the first instance, the surface is full of life and movement ; the light falls on its tiny depressions and irregularities, awakening wayward reflections strengthening and palliating its colors, developing its lustres and translucencies, so that it becomes rich in story as well as in hue. In the other there is the dead level of polished surface, unassailably perfect, but, comparatively speaking, uninteresting. The life and vivacity of the marble are gone ; it is merely a polished record, with the pleasant part of its individuality rubbed away into a wearisome uniformity.

CRUSHING BLAST FURNACE SLAG.

An important industry has grown up in the Schuylkill Valley region of Pennsylvania in crushing the slag found in the huge cinder banks surrounding the blast furnaces. This material is crushed to all sizes, and is used for roofing, concrete, macadamizing and the manufacture of patent stone. The demand for it has steadily increased and it is being shipped to points as far east as Boston, and as far south as New Orleans. One or two large cinder banks have already been exhausted, but there still remain many millions of tons. There are large crushing plants now established at Leesport, Moselem, Mt. Laurel, and at Bechtelsville. It is declared that only the slag produced years ago is of value, as the recent output of the furnaces is worthless for these purposes.

LOADS ON FOUNDATIONS.

The following are the safe loads recognised by the New York Building Code:—"Soft clay, one ton per square foot; ordinary clay and sand together, in layers, wet and springy, two tons per square foot; loam, clay or fine sand, firm and dry, three tons per square foot; very firm, coarse sand, stiff gravel or hard clay, four tons per square foot, or as otherwise determined by the Commissioner of Buildings having jurisdiction." In Chicago the highest load recognised is 4,500 lbs. per square foot. It is necessary therefore to devise remarkable methods to overcome the shortcomings of the natural foundations. The expense which is sometimes inevitable is exemplified by a building in San Francisco wnich is 75 feet square. Below the surface of the site, at a depth of 25 feet, is a concrete platform 96 feet by 100 feet, and 2 feet thick. On this is a layer of 15-inch rolled girders, making a continuous beam 96 feet long; above are alternate layers of concrete and girders, and the area thus constructed is 70 per cent. greater than the actual floor area of the building. By this costly arrangement it is calculated the pressure on the earth's surface will not exceed 4,500 lbs. per square foot.

AN INSTRUMENT FOR DETERMINING THE HARDNESS OF WOODS.

In every description of wood, by a practical man, says Mr. Herbert Stone, in a paper read before the Society of Arts, the elements of weight, hardness and colour are considered. Sometimes the weight per cubic feet is given, and the colour, apart from its fluctuations, is often accurately pictured, but the hardness is a quality which is practically left to our imagination. I have been so much impressed with the necessity of some means of measuring the degree of hardness that I have constructed an instrument which is capable of giving a fairly accurate reading of the resistance to impact of a wood (not of its hardness pure and simple, because the resistance to impact is made up of elasticity plus hardness), but it is a fair parallel to the impression of that which we call the hardness makes upon our sense of touch. I will not weary you with a description of this contrivance, but will merely mention that the principle is as follows: A steel ball of a known weight falling a definite distance upon a surface at an angle of half a right angle will fly off in a horizontal direction, and describe a curve or trajectory which will be longer or shorter according to the amount of force absorbed by the wood. A self-recording arrangement and all necessary adjustments are attached to the machine. The hard and soft zones of a wood give different readings, so that a number of trials have to be made and an average struck. I take the average of ten trials, displacing the wood five millimetres between each.

ANCIENT METHODS OF FLOORING.

Before Portland cement and concrete were introduced, builders had recourse to some strange expedients for flooring, says the London Builder's Reporter. Sir Hugh Plat maintained that ox blood and fine clay tempered made the best floor in the world, end that this mixture laid in any floor or wall formed a very strong and binding material. The usual method for earthen floors was to take two-thirds of lime and one of coal ashes well sifted with a small quantity of loamy clay, to mix the whole and temper it well with water. The stuff was allowed to lie in a heap for eight or ten days. This process was repeated at intervals until it became smooth, yielding, tough and gluey. The stuff was then laid to a depth of about 3 inches thick, during the hot season for preference and smoothed with a towel. Floors of that kind were in favour for malthouses. If cheapness was required coarser materials were used. For better-class floors, in addition to the preceding mixture, a further mortar coating was laid down to a depth of half an inch. This consisted of lime made of rag stones, tempered with a little white of eggs, the more eggs the better, to a very high pitch. It was necessary that the second layer should be laid down before the under-flooring was too dry, so as to insure their incorporation. If the flooring was rubbed with oil it was supposed to assume a polish which gratified the eyes of housewives.

BUILDING LEGENDS AND CURIOSITIES.

There is much that is curious and legendary associated with the matter-of-fact art of building. Thus, it has been written of the spire of Chesterfield Church—which many consider wonderful, though, as a fact, it is only somewhat out of the perpendicular—

> Poor devil! poor spite,
> To make a spire a laughing-sight.

This rhyme refers to the perversity of the builder, who originally erected the church without a spire, but, being compelled to add one, made it crooked. One of the legends attributes the mischief to the Prince of Darkness, who one day, being fatigued, folded his wings and rested on the steeple. Some of the incense which was being wafted in the aisles below escaped from the church, crept up the steeple, and tickled the archfiends' nose to such purpose that he gave a terrific sneeze and so dislocated the steeple that it has been twisted ever since! Another tale in connection with this church is that on the occasion of a wedding party passing into the building the steeple bowed to the bride and bridegroom and has remained crooked ever since. The same tradition attaches to an old church at Lancashire, of which it is said:—

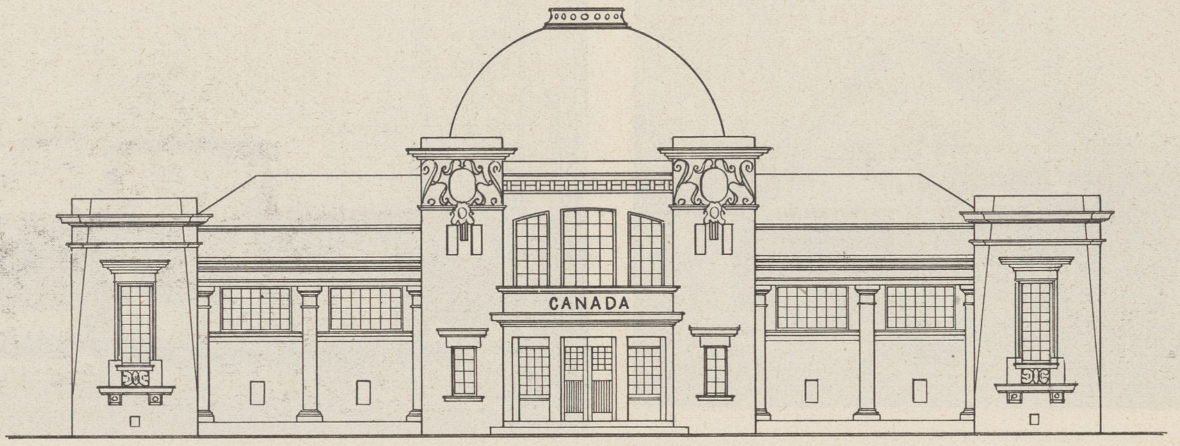
> The church at Little Winwick,
> It stands upon a sod;
> And when a maid gets married there
> The steeple gives a nod.
>
> Alas! how many ages
> Their rapid flight have flown,
> Since on that high and lofty spire
> There's moved a single stone.

THE PARK AVENUE HOTEL FIRE.

To the Editor of the CANADIAN ARCHITECT AND BUILDER:

Sir,—It pertains to you, through the columns of your now widely circulated journal—to you, say, the exponent of architectural requirement in Canada or elsewhere to abet me in endeavoring to obtain such compulsory legislation as will put an end to these ever-recurring fatalities.

I petitioned the U.S. government and that of Canada in January, 1901, to do the needful, when they both replied that it pertains to the several states of the union, and to the several provinces to legislate on such matters; while the requirement being the same it would be so much more simple and expedient for the central government to enact a law for the purpose.



CANADIAN BUILDING FOR THE WOLVERHAMPTON EXHIBITION, WOLVERHAMPTON, ENGLAND.

The architect has solved his share of the problem, It pertains now to the government to enact under penalty that what is suggested be carried out.

The system was exhibited in Paris in 1900 and reproduced by the Scientific Journals of that city which admitted it to be as set forth in the heading to the exhibit, the only sure, simultaneous and instantaneous mode of escape from the upper floors, dormitories, etc., of convents, colleges, hospitals, lunatic and other asylums, hotels, theatres, etc., for old or infirm men and women, children, the sick, the demented. By means of a walled-in stairway to reach and enter which one must go out on to a balcony communicating therewith. At foot of stairway, a fire-proof corridor reaching through the building to an exit at street level. The stairway situated at rear of building so as not to enroach on more valuable space on the street front, and the corridor raised over head or to the ceiling of the ground floor or story, that is the principal floor or "Rez de-chaussee" so called by the French; in a way that it may be passed under so as to interfere in no manner with the interior economy of the building, or circulation of the public on said floor.

CHAS. BAILLARGE,
Architect and Engineer.

Quebec, March 3rd, 1902.

FIRE-PROOFING MATERIALS AND METHODS.

Mr. Edward Atkinson, the well-known insurance expert of Boston, has addressed to the Manufacturers' Mutual Life Insurance Co., the following:

A few months since, before my recent visit to England, I made an effort to secure materials and contributions for a thorough test of so-called fire-proofing materials, floors and the like, mainly devised for the protection of steel from heat. This effort was not sustained to any considerable extent by the promoters of various types of construction nor by the makers of concrete. I therefore dropped the subject for the time.

On my recent visit to London, in consultation with the architects and engineers who constitute the British Fire Prevention Association, I was confirmed in my distrust of some of the materials which have been commended for the protection of iron and steel used in construction. The attention of that Association is mainly given to what is called "fireproof construction," not only in city buildings but in factories and workshops as well.

Our attention has been mainly given to the slow burning construction of brick and timber, and we have not yet been called upon to deal in any large way with steel construction. In anticipation of such demand upon us it is necessary for us to know the present state of the art.

In Great Britain it is said to have been proved that many of the concretes, some of which are there called "breeze," of which coal ashes are the principal component material, are very destructive to iron and steel. These ashes come from coals containing a good deal of material which may cause corrosion, and the long-continued contact even of dry ashes with iron and steel beams, wire or thin plates, imbedded in them, is said to oxidise them. This may come however from the avidity with which ashes absorb humidity from the atmosphere and may be attributed to that rather than to any other fault in the ashes.

Any concrete or any material containing plaster of Paris (sulphate of lime) is known to be somewhat dangerous if not destructive, and there may be other causes of corrosion as yet unknown to us. We know of some cases in which corrosion has set in very rapidly on gas pipes and on cribs of rails intended for foundations, owing to corrosive qualities in the concrete in which they were imbedded. We are aware that many investigations and reports have been made by the representatives of special methods, but we are not informed of any general report or conduct of tests corresponding to those now being made by the architects and engineers who have organized the Fire Prevention Association of Great Britain. We therefore address the following questions to you:—

1st. What attention have you yet given to causes of corrosion other than ordinary humidity which may get through minute cracks in any kind of veneer or covering for steel members? In other words, what causes of corrosion have been developed in your practice other than those arising from dampness?

2nd. What precautions have been taken to meet this hazard?

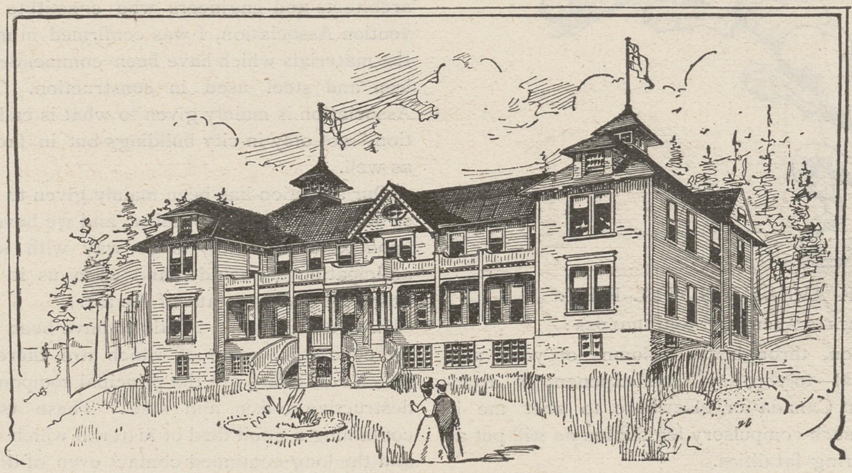
3rd. What general or special information has been printed upon this subject? Who are the authorities and what printed material can be found and where?

4th. What studies are you yourselves making in this matter?

5th. What knowledge have you of active corrosion from dry materials coming in contact with the iron or steel frames, posts, or other members of any building, or iron used in foundations?

6th. To what extent do you depend, if at all, upon angle irons, wire or sheet metal imbedded in concretes for floors or arches, for the stability of the floor after the cement or concrete has become permanently set?

I have asked these questions with the intention of making arrangements for an exhaustive study of this subject and for such tests as may be possible of each and all the various coverings now upon the market for protecting iron and steel; the concretes, the fireproof floors, and all other matters in which corrosion from any cause may be a source of danger."



FREE HOSPITAL AND COTTAGES IN CONNECTION WITH THE SANITARIUM FOR CONSUMPTIVES AT GRAVENHURST, ONT.

APPORTIONING THE COST OF PERMANENT PAVEMENTS.

Alderman Crane, of the Toronto City Council, has given notice of his intention to move that the city engineer be instructed to report to the Council the class of pavements which he considers (taking into consideration the locality where the same is laid) to be permanent pavements, and that the Council determine the class of pavements which shall be deemed permanent, and that thereafter the local improvement or other by-laws affecting the same be amended so as to provide that where a permanent pavement is once laid as a local improvement, the same shall be kept in perpetual repair out of the general funds of the city. This action on the part of Alderman Crane is in the right direction. The local improvement system, as it at present exists, is, in some respects, very unfair to property owners. The persons who are most benefitted by permanent pavements are owners of departmental and other stores who use a large number of vehicles for the delivery of their goods. These companies effect a large saving yearly in horses and vehicles by reason of the improved pavements which have been put down in recent years, the cost of which has been charged, to a large extent, against the property owners on the various streets. We refer now more particularly to the residential streets where, it is safe to say, the pavement is least used by the owners of the property fronting on the street. This being the case, it is manifestly unfair that that the property owners should be called on to bear so large a proportion of the cost of improved pavements. While it is no doubt true that the value of property is, to some extent, enhanced by the putting down of good pavements, it is also true that increased assessment invariably follows, so that the net advantage is small. A larger proportion of the cost of such pavements should in future be borne by the taypayers as a whole, while if means can be found of placing a considerably increased assessment for this purpose on the shoulders of the owners of delivery wagons, it ought to be done.

SANITORIUM FOR CONSUMPTIVES AT GRAVENHURST, ONT.

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A Monthly Journal of Modern Constructive Methods,

(With a Weekly Intermediate Edition—The CANADIAN CONTRACT RECORD).

PUBLISHED ON THE THIRD WEDNESDAY IN EACH MONTH IN THE INTEREST OF

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NOTES.

Mr. O. G. Carscallen, Vice-President of the Gurney Tilden Company, of Hamilton, was recently presented by the travellers of the company with a gold-headed cane.

Professor Galbraith, Principal of the School of Practical Science, Toronto, was the guest of honor at a dinner held on Feb. 28th by the S. P. S. graduates resident in Pittsburg.

The outcome of a lawsuit at Cleveland over a party wall dispute, has led to the giving of positive orders to the city engineering and building departments, to carefully survey property on which business buildings are to be erected in future and establish beyond question the lines of the lot or plot of ground on which such improvements are to be made. This will prevent a repetition of this case. Other large cities might profit by Cleveland's experience.

Analysis of the incrustations taken from the Portland stone balustrade round the base of the dome of St. Paul's Cathedral, shows them to be composed chiefly of hydrated sulphate of lime associated with some siliceous matter and minute particles of carbon in the form of soot. The solvent action exerted by rain charged with sulphurous and sulphuric acid derived from the gases and smoke of innumerable chimneys of the surrounding buildings, has, after the lapse of two centuries, transformed the original carbonate of lime of the Portland stone into sulphate of lime, which in a more or less soluble condition has been carried by water action and gradually deposited as calcareous tufa or stalagmite on the underside of the coping-stone.

BY THE WAY

The New York Times publishes a list of the towns and cities to which Mr. Andrew Carnegie has given grants of money to assist the erection of public libraries. His givings for this purpose total $13,813,000 on this continent and $800,000 in Scotland and Ireland. The grants to Canadian cities and towns are as follows: Collingwood, $10,000; Montreal, $150,000; Ottawa, $100,000; Vancouver, B. C., $50,000; Windsor, Ont., $20,000; Winnipeg, $100,000, total $530,000.

× × ×

The American project to erect an immense office building on the Strand in London is said to have been abandoned owing to the inability of the County Council to grant a lease for 999 years. The Pall Mall Gazette rejoices that the powers of the Council in this respect are limited, and in consequence what it terms a building of the "Early packing-case order of architecture developed by the sucking palladios of Chicago and sometimes known as the perpendicular Goth and Vandal style" will not disfigure one of modern Babylon's leading thoroughfares.

× × ×

There should be a clause in the building by-law of every city fixing the distance from the street curb beyond which new buildings could not be carried. On one of the principal residential streets of Toronto at prominent city official has had large additions put to the front of his residence, thereby causing the building to jut out many feet beyond the neighboring houses, the owners of which are in consequence deprived of the view up and down the street which they formally enjoyed. The value of their properties is also seriously impaired, but they apparently have no redress. If the city had an up-to-date building law the rights of property owners would be protected, and if violated as in this instance, means of redress would be afforded.

× × ×

The eccentricities of elevators and persons in charge, came up for discussion the other day. An English elevator or hoist as it is there called, was described as constantly returning to the first floor for every new passenger without first delivering at their destinations the passengers already aboard. Several elevators in Toronto were mentioned for their snail-like quality, which also became a marked characteristic of the attendants. On the other hand there are elevators which move at speed which takes one's breath away. A story is told of a stammering passenger who getting on one of these lightning elevators desired to be put off at the fifth floor, but was landed at the twenty-ninth floor before he could deliver his instructions.

STUDENTS' DEPARTMENT.

PROPORTION AND PRINCIPLE.

There was much sound sense in the address to students of the president, Mr. W. Emerson, read at a meeting of the R.I.B.A. Mr. Emerson touched on "proportion" in connection with the practice of the art of architecture, a word whose value and meaning, as he remarked, may easily be lost sight of. To the architect's mind may probably immediately be suggested the comparative relation of one architectural detail to another and to the whole composition. But besides the objective symmetry and harmonic degree of form or size, proportion may be considered by the architect in other ways. Of course, proportion in this sense is the very first essential of fine architecture. It should be an inherent faculty in the architect and artist but it may be cultivated. And proportion must descend also to the smallest details. Proportion in color is also a most important factor in the excellence of artistic work. The study of nature is the guide as to how much of any one color will harmonize with another. There is also a proportion in architectural work which requires to be maintained between coarseness and refinement. This is a very subtle point in all good work. Too much refinement in architectural work tends to weakness of effect and deprives it of its masculinity. At the other extreme, "muscular" architecture, as it has been termed, may degenerate into coarseness. It is the carefully balanced proportion between these that avoids either extreme. The effect of all the finest architecture has been attained by a combination of strength and power with refinement of well-proportioned and beautiful detail. Too much care cannot be bestowed on the proportion that sculptured and other decorations bear, first to the whole composition and secondly to each other. In all this the architect's should be the guiding spirit, however much may be done by the craftsman or sculptor.

Then, he continued, there is the necessity for a proper proportion being maintained between work and rest. There is such a thing as staleness. The want of recreation makes a man dull, unfit for companionship or sympathetic mingling with or interest to his fellows ; and his work suffers in consequence. Also, there must be margin for reflection and thought. Great achievements usually germinate in quiet moments. Of much importance in connection with the practice of the architect, as in all other businesses in life, there is another thing that must be borne in mind, and that is right principle. This in architecture will mean an avoidance of shams and false construction, which somehow always manage to look wrong, even though worked on such a grand scale as the external walls of St. Paul's, or the impudent ugliness of our shops with stone facades, apparently standing on nothing. Truth makes work look consistent and correct ; lack of it offends good taste. Palatial decorations in offices, ecclesiastical embellishments in restaurants, the affectation of cottage simplicity in a palace, or vice versa, imply a want of appreciation of the fitness of things, and are wrong in principle ; and this element of truthful principle in architectural art should be carried down to the smallest detail if the work is to live. Then there should be right principle in your motive of action ; and this is the most important point if you desire not only your personal position to be respected by others but also wish to uphold the dignity and status of your profession generally. Professional respect must ever depend on the character, conduct and aims of the units in the profession. The architect should, on principle, enrich his mind and render himself proficient in all branches of his work, as his duty to his clients, and should deal fairly and avoid harshness in dealing with those over whom he is set as a supervisor.

ANCIENT METHODS OF LIFTING HEAVY STONES.

Of all the problems associated with the Egyptians none is more interesting, says a writer in the Quarry, than that summed in the question, How were the Pyramids built? The land of the lotus is ever a mystery to us, the civilization of its ancient people an enigma, its colossal ruins awe-inspiring, wondrous and unique in the history of the world. Our knowledge, however, of their aims and achievements is slowly growing in extent and lucidity, thanks to the painstaking investigations of archæologists, scientists and engineers, and we now know for certain that the Egyptians were a most scientific and mechanical people. Nebka, a king who lived nearly six thousand years ago, was "skilled in the art of erecting solid masses of hewn stone," and the practice continued for thousands of years, the passion for building colossal structures being most predominant between B. C. 1600 and 1200. Cheops, in his great pyramid, was content with stones weighing about fifty tons each, but stones twenty times as heavy were used in the two huge statues of Amenhotep III. on the plain of Thebes. Solomon put a 90-ton stone in the outer wall of Temple Hill at Jerusalem 100 feet from the ground, while the portal of the treasury of Atreus is covered by a stone weighing 130 tons. Then, again, coming to later times, we find stones 40 feet long, 10 feet thick, and no one knows how wide, in the castle wall at Osaka in Japan, and even if they are only 10 feet wide they would each weigh 300 tons. It cannot be denied, as Commander Barber says in his recently-published book on "The Mechanical Triumphs of the Ancient Egyptians," that a huge solid statue is more imposing than anything built up in small pieces. What are the Goddess of Liberty (150 feet high) at the entrance to New York harbour or the Sleeping Buddah of Bangkok (160 feet long), both hollow, in comparison to the granite statue of Rameses the Great! "They need care to prevent decay, and they will never remain of themselves an everlasting monument of the Godlike power of a king." But the problem is, How did the Egyptians erect such wonders? There have been a great number of theories expounded, but after all the old one of the inclined plane is the one most probable and the most satisfactory.

The Chicago City Council has rescinded the by-law limiting the height of buildings.

The Gurney Tilden Company, of Hamilton, have recently established a branch of their business in British Columbia in charge of Mr. C. A. Godfrey.

By a great blast at Bonawe quarry, in Argyllshire, in which 20,000 pounds of gunpowder were used, upwards of a quarter of a million tons of granite were displaced. The mine was driven into the centre of the quarry face for 70 feet with two arms each reaching 50 feet. It was the first attempt in any of the granite quarries to pierce by rock drills and compressed air, and was carried out in the short time of ten weeks.

UNITED STATES COMPETITION.

The Canadian Manufacturers of Portland cement are taking concerted action with a view to endeavoring to induce municipalities to use only Canadian cement, and have also interviewed the Government to urge a readjustment of the duty. The rapidly increasing capacity of cement manufactories in the United States, and the consequent keenness of competition has resulted in directing the attention of these manufacturers to the Canadian market. Of late a large amount of cement from the United States has been sold in Canada at low prices. The manufacturers here claim that the capacity of the Canadian mills is now about 1,000,000 barrels per annum, aud that this quantity is sufficient to supply the home demand. We notice that the city of Hamilton, to which an appeal was made to use only Canadian cement, accepted the tender of a United States firm which was the lowest submitted. This no doubt indicates the course which is likely to be pursued by municipalities genera ly. The only hope of relief to the manufacturers, therefore would seem to be from a readjustment of the duties. In connection with this it may be said that manufacturers in other lnes are feeling keenly the effect of competition from the United States, and a thorough revision of the tariff, at an early date, would seem to be desirable. If United States manufacturers desire to share in the benefits of Canadian business, they should as far as possible, be compelled to produce their goods in this country. Even under the present moderate tariff many United States manufacturers are finding it to their advantage to establish branches in this country, and if our tariff was carefully revised and readjusted, many more would establish themselves here, thereby increasing the opportunity for employment and adding to the national wealth.

A CORRECTION.

MONTREAL, March 4th, 1902.

To the Editor of the CANADIAN ARCHITECT AND BUILDER :

SIR,—In the last issue of the architects' edition of your paper, are two views of Christ Church Cathedral, in this city, the architect for which is stated to have been "John Wells."

The man who designed the cathedral here, and also the one at Fredricton, N.B., was named "Wills," and he died in the General Hospital here before the work on Christ Church was begun.

The building with all its details, was carried out by the late Thomas S. Scott, who was afterwards Chief Dominion Architect.

John Wills was a practicing architect here over 50 years ago. He designed and carried out the Bank of Montreal, with its noble Corinthian portico, the Bank of British North America, and many other buildings both public and private.

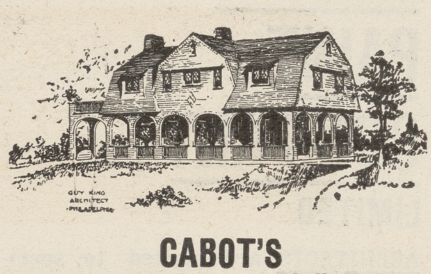
JAMES NELSON.

EXAMINATION TO QUALIFY FOR ASSOCIATESHIP IN THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

The Royal Institute of British Architects desiring to give facilities for those in the Colonies to qualify by examination for associateship in the R. I. B. A., will hold the second examination from July 4th to 10th, 1902, in Montreal. Applications, fees and probationary work must reach London not later than May 5th, 1902. Intending candidates who must be over 25 years of age, can obtain application forms and copies of the previous examinations on application to

ANDREW T. TAYLOR,
Hon. Sec. R. I. B. A. for Canada,
43 St. Francois Xavier St., Montreal.

All who are full members of the Province of Quebec Association of Architects and the Ontario Association of Architects by examination are exempt from probationary work.



COMPLIMENTARY DINNER TO MR. D. B. DICK

On February 27th last the members of the old Architectural Guild of Toronto dined together in honour of Mr. D. B. Dick upon the occasion of his going away for a long holiday in Europe. As was truly said at the dinner a more extended body of entertainers would better represent Mr. Dick's well-wishers in the profession; but the entertainers on the present occasion were the smaller body of more intimates associates whose relations with Mr. Dick have been personal. Since the days when the Architectural Guild first brought members of the profession together Mr. Dick has been a leading member of the architectural societies, listened to with the respect that a right opinion and a courteous manner always command. But a great source of Mr. Dick's influence has been the knowledge that he has had personally nothing to gain by promoting the objects of the Association of Architects and nothing to lose if it failed to attain them. He has thus become a type of the ideal member of an association founded for public ends, and has helped much to establish the large minded and public spirited points of view so essential for an association of this kind. We wish Mr. Dick a prosperous holiday and a safe return.

Mr. F. S. Baker, F.R.I.B.A., of Toronto, recently registered at the Canadian Government offices in London.

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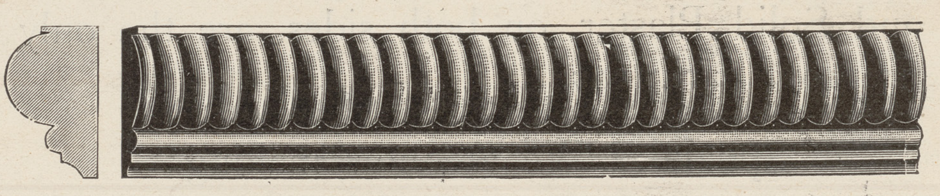

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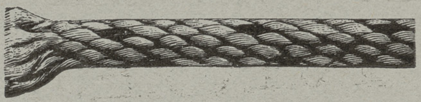

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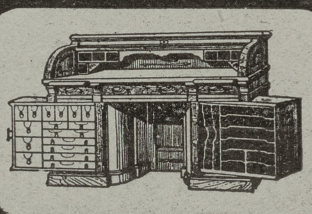

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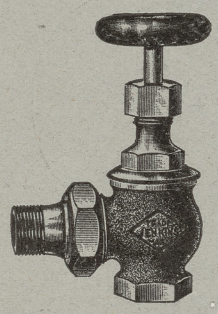

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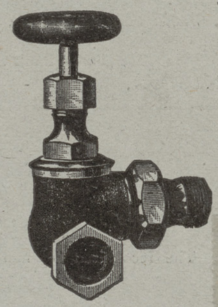

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